

From	To	Multiply By
5.2.11 Viscosity (kinematic)		
centistokes	square millimeter per second (mm²/s)	1
5.2.12 Energy, work, heat		
kilowatthour	megajoule (MJ)	3.6
NOTE: The kilowatthour is accepted as a unit of electrical energy only. The SI unit of energy, the joule , which is equal to the newton meter or the watt second, is recommended for all applications.		
calorie (as used in physics)	joule (J)	4.184
NOTE: The calorie listed here is the thermochemical calorie. Other values of the calorie have been used.		
calorie (as used in nutrition)	kilojoule (kJ)	4.184
NOTE: The calorie used in nutrition is the same as the thermochemical kilocalorie. All use of the calorie is deprecated.		
Btu	kilojoule (kJ)	1.055 056
NOTE: The British Thermal Unit (Btu) used in this standard is the International Table Btu adopted by the Fifth International Conference on Properties of Steam, London, 1956.		
therm (U.S.)	megajoule (MJ)	105.480 4
horsepower hour	megajoule (MJ)	2.684 520
foot pound-force per second	joule (J)	1.355 818
5.2.13 Power		
NOTE: Power is the rate of energy transfer. The SI unit for all forms of power—mechanical, electrical, and heat flow rate—is the watt .		
ton, refrigeration	kilowatt (kW)	3.516 85
Btu per second	kilowatt (kW)	1.055 056
Btu per hour	watt (W)	0.293 071 1
horsepower (550 foot pounds-force per second)	watt (W)	745.699 9

	From	To	Multiply By
5.2.13	<i>Power (continued)</i>		
	horsepower, electric	watt (W)	746
	foot pound-force per second	watt (W)	1.355 818

5.3 Quantities of Heat

5.3.1 *Temperature*

NOTE: The SI unit for customary temperature is the **degree Celsius** ($^{\circ}\text{C}$). In inch-pound units customary temperature is expressed in degrees Fahrenheit. The formula for converting customary temperature is: $t_c = (t_f - 32) / 1.8$

The SI unit for thermodynamic temperature T_K is the **kelvin** (K). Celsius temperature is defined by the equation: $t_c = T_K - 273.15 \text{ K}$.

The inch-pound unit for thermodynamic temperature is the degree Rankine. The formula for converting thermodynamic temperature is: $T_R = T_K / 1.8$.

A temperature interval may be expressed in SI either in kelvins or in degrees Celsius, as convenient. The formula for converting a temperature interval Δt in degrees Fahrenheit into SI is: $\Delta t_K = \Delta t_c = \Delta t_f / 1.8$

5.3.2 *Linear expansion coefficient*

reciprocal degree Fahrenheit	reciprocal kelvin (K^{-1}) or reciprocal degree Celsius ($^{\circ}\text{C}^{-1}$)	1.8
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5.3.3 *Heat*

NOTE: Heat is a form of energy. See 5.2.12

5.3.4 *Heat flow rate*

NOTE: Heat flow rate is a form of power. See 5.2.13

5.3.5 *Thermal conductivity*

Btu inch per hour square foot degree Fahrenheit	watt per meter kelvin [W/(m·K)]	0.144 227 9
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5.3.6 *Coefficient of heat transfer*

Btu per hour square foot degree Fahrenheit	watt per square meter kelvin [W/(m²·K)]	5.678 263
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	From	To	Multiply By
5.3.7	<i>Heat capacity</i>		
	Btu per degree Fahrenheit	kilojoule per kelvin (kJ/K)	1.899 108
5.3.8	<i>Specific heat capacity</i>		
	Btu per pound degree Fahrenheit	kilojoule per kilogram kelvin [kJ/(kg·K)]	4.186 8
	NOTE: The quantities 5.3.5 through 5.3.8 are defined in terms of temperature interval. Therefore K may be replaced by °C.		
5.3.9	<i>Entropy</i>		
	Btu per degree Rankine	kilojoule per kelvin (kJ/K)	1.899 108
5.3.10	<i>Specific entropy</i>		
	Btu per pound degree Rankine	kilojoule per kilogram kelvin [kJ/(kg·K)]	4.186 8
5.3.11	<i>Specific internal energy</i>		
	Btu per pound	kilojoule per kilogram (kJ/kg)	2.326
5.4	Quantities of Electricity and Magnetism		
	NOTE: The common electrical units ampere (A), volt (V), ohm (Ω), siemens (S), coulomb (C), farad (F), henry (H), weber (Wb), and tesla (T) are SI units that are already in use in the United States. The various cgs units shall no longer be used.		
5.4.1	<i>Magnetic field strength</i>		
	oersted	ampere per meter (A/m)	79.577 47
5.4.2	<i>Magnetic flux</i>		
	maxwell	nanoweber (nWb)	10
5.4.3	<i>Magnetic flux density</i>		
	gauss	millitesla (mT)	0.1
5.4.4	<i>Electric charge</i>		
	ampere hour	coulomb (C)	3 600

	From	To	Multiply By
5.4.5	<i>Resistivity</i>		
	ohm circular mil per foot	nanoohm meter ($\text{n}\Omega \cdot \text{m}$)	1.662 426
5.4.6	<i>Conductivity</i>		
	mho per centimeter	siemens per meter (S/m)	100
5.5	Quantities of Light and Related Electromagnetic Radiation		
	NOTE: No change in U.S. customary usage is required for the following quantities: radiant intensity, watt per steradian (W/sr); radiance, watt per steradian square meter ($\text{W/}[\text{sr} \cdot \text{m}^2]$); irradiance, watt per square meter (W/m^2); luminous intensity, candela (cd); luminous flux, lumen (lm); and quantity of light, lumen second ($\text{lm} \cdot \text{s}$).		
5.5.1	<i>Wavelength</i>		
	ångström	nanometer (nm)	0.1
5.5.2	<i>Luminance</i>		
	lambert	candela per square meter (cd/m^2)	3 183.099
5.5.2	<i>Luminance (continued)</i>		
	candela per square inch	candela per square meter (cd/m^2)	1 550.003
	footlambert	candela per square meter (cd/m^2)	3.426 259
5.5.3	<i>Luminous exitance</i>		
	lumen per square foot	lumen per square meter (lm/m^2)	10.763 91
5.5.4	<i>Illuminance</i>		
	footcandle	lux (lx)	10.763 91
5.6	Quantities of Radiology		
5.6.1	<i>Activity (of a radionuclide)</i>		
	curie	megabecquerel (MBq)	37 000

	From	To	Multiply By
5.6.2	<i>Absorbed dose</i>		
	rad	gray (Gy)	0.01
		centigray (cGy)	1
5.6.3	<i>Dose equivalent</i>		
	rem	sievert (Sv)	0.01
		millisievert (mSv)	10
	millirem	millisievert (mSv)	0.01
		microsievert (μSv)	10
5.6.4	<i>Exposure (x and gamma rays)</i>		
	röntgen	coulomb per kilogram (C/kg)	0.000 258

BIBLIOGRAPHY

American National Standard for Metric Practice, ANSI/IEEE Std 268-1992,
Institute of Electrical and Electronics Engineers, Inc.

Requests for copies should be addressed to the Institute of Electrical and Electronics Engineers (IEEE),
Standards Department, 445 Hoes Lane, Piscataway, NJ 08855.

*SI Units and Recommendations for the Use of their Multiples and of Certain
Other Units*, ISO 1000-1992

Requests for copies of this international standard, which is maintained by the International
Organization for Standardization (ISO), should be addressed to the American National Standards
Institute, 11 West 42nd St., New York, NY 10036.

*Standard Practice for Use of the International System of Units (SI) (the
Modernized Metric System)*, ASTM E 380-91a

Requests for copies should be addressed to the American Society for Testing and Materials
(ASTM), 1916 Race Street, Philadelphia, PA 19103.

Rules for SAE Use of SI (Metric) Units, SAE J916 (Rev. May 91)

Requests for copies should be addressed to Society of Automotive Engineers, Inc. (SAE), 400
Commonwealth Drive, Warrendale, PA 15096.

Metric Editorial Guide (fifth edition), ANMC-92-1

Requests for copies should be addressed to the American National Metric Council (ANMC),
Publication Services, 301 Warren Ave., Suite 217, Baltimore, MD 21230

Guide to the Use of the Metric System, 1992 edition

Requests for copies should be addressed to the U.S. Metric Association (USMA) 10245 Andasol
Ave., Northridge, CA 91325-1504.

The International System of Units (SI), National Institute of Standards and
Technology (NIST) Special Publication 330 (1991 Edition)*

*Guide for the Use of the International System of Units, The Modernized Metric
System*, NIST Special Publication 811*

Interpretation of the SI and Metric Conversion Policy for Federal Agencies,
NIST Special Publication 814*, which includes:

*Metric System of Measurement; Interpretation of the International System
of Units for the United States*, (55 F.R. 52242, Dec. 20, 1990);

Metric Conversion Policy for Federal Agencies, 15 CFR Part 1170; and

Metric Usage in Federal Government Programs, Executive Order 12770 of
July 25, 1991 (56 FR 35801, July 29, 1991)

*Requests for copies should be addressed to the National Technical Information Service, 5285 Port
Royal Rd., Springfield, VA 22161.